A systematic review and meta-analysis of dementia prevalence in seven developing countries: A STRiDE project

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Abstract

The STRiDE project sets out to support the development of effective dementia policy in middle-income countries. As part of this it will generate new data about the prevalence of dementia for a group of countries (Brazil, India, Indonesia, Jamaica, Kenya, Mexico, and South Africa). This study aims to identify the current estimates of dementia prevalence in these countries and where the gaps lie in the current literature. A systematic review was completed on 30th April 2019 across electronic databases, identifying dementia prevalence literature originating from any of the seven countries. Four hundred and twenty-nine records were identified following de-duplication; 28 studies met the inclusion criteria and were included in the systematic review. Pooled estimates of dementia prevalence ranged from 2% to 9% based on DSM-IV criteria; these figures were generally higher in studies using other diagnostic criteria (e.g. the 10/66 algorithm). Available prevalence data varied between countries. Only Brazil, Mexico and India had data derived from studies judged as having a low risk of bias. Irrespective of country, studies often were not explicit in detailing the representativeness of their sample, or whether there was non-response bias. Further transparent and externally valid dementia prevalence research is needed across the STRiDE countries.

Keywords: middle-income, diagnostic criteria, older adults

Introduction

With population ageing, the number of people living with dementia is growing rapidly, especially in low- and middle-income countries (Prince, Guerchet, et al., 2013). Worldwide, an estimated 47 million people had dementia worldwide in 2015; this number is projected to increase to 66 million by 2030, and 131 million by 2050 (Prince et al., 2015). In low- and middle-income countries, the increase in numbers with dementia is happening within a context of health- and social-care systems that are generally unprepared for this challenge. Many low- and middle-income countries have very few data on dementia prevalence. One element of the STRiDE programme (STrengthening Responses to dementia In DEveloping countries, www.stride-dementia.org/) aims to fill this gap by generating new prevalence evidence in a subset of the seven STRiDE countries (Brazil, India, Indonesia, Jamaica, Kenya, Mexico, and South Africa). STRiDE is designed to support, perhaps to accelerate, the development of effective dementia policy and national planning in these seven countries, with the ultimate goal of improving dementia care, treatment and support systems so that people with dementia are able to live well. We chose the seven STRiDE counties on two criteria, the first was that they should represent a range of circumstances (population size, land mass sizes, different Gross Domestic Product sector compositions of agriculture, industry and service but all with 45% or higher reliance on the service sector) and needs, demonstrate different degrees of progress towards meeting the challenges presented by dementia, and are all on the list of Official Development Assistance (ODA) recipients. The second was pragmatic on the basis of existing research and policy links and willingness to participate.

Previous systematic reviews in this area tend to focus on single countries (e.g. Dong et al. 2007; Fagundes et al. 2011) or countries that are geographically close (e.g. Wu et al. 2013); this may prevent researchers from identifying patterns across developing countries. A notable exception is the World Alzheimer's Report 2015 (Prince et al., 2015). The novelty of our review lies in its deep dive into the data available in the seven STRiDE countries, including focussed efforts to uncover a broader set of literature that may be more difficult to capture (e.g. inclusion of non-peer reviewed reports), whilst also being able to identify overarching themes between countries. Our primary aim was to obtain accurate, up-to-date estimates of dementia prevalence, in people aged over 60, across the seven STRiDE countries. We also aimed to appraise the design and methods of existing primary studies to formally assess their proneness to bias, so as to help design a harmonized STRiDE dementia prevalence study

protocol. The review used a validated risk-of-bias instrument to identify strengths and weaknesses of previous studies.

Methods

This protocol was registered on PROSPERO (CRD42018089999) and adhered to the PRISMA guidelines.

Eligibility Criteria

We applied the inclusion and exclusion criteria originally used for the 2015 World Alzheimer's Report (Prince et al., 2015), with some adaptations aimed at increasing inclusiveness. Most notably, our review included non-peer reviewed publications and allowed for a broader range of diagnostic criteria to be applied for detecting dementia, recognising that diagnostic criteria that require clinical training may be prohibitive in low- and middle-income countries.

Inclusion Criteria

- Population-based studies of the prevalence of dementia among people aged 60 years and over.
- No formal diagnostic standard was required, so long as it had face validity. For example, if the study did not use an internationally recognised diagnostic standard (e.g. DSM-IV), then the authors needed to provide evidence that the criteria used had the equivalent sensitivity and specificity. Face validity was determined first by reading the reported validity as presented by the identified full-texts, and then by reading any cited publications related to the diagnostic validity. If unclear about the validity based on the literature presented within the full-text, the research team would search for evidence of validity of the diagnostic tools, and discuss between the two researchers.
- Studies that independently reported data from at least one of the seven STRiDE countries.

Exclusion Criteria

- Studies in which diagnosis of dementia depended on accessing dementia care services.
- Studies sampling from an out-of-date population (i.e., register compiled > 3 years prior to data collection)
- Studies sampling from a specific care setting, or other unrepresentative healthcare population.
- Studies in which only the prevalence of specific dementia sub-types were reported.
- Studies restricted to young-onset dementia (<59 years old).

Information Sources

We used iterations of the syntax 'dementia AND (prevalence OR epidemiology)' (below) to search relevant databases (PubMed, SCOPUS, PsychINFO, SciELO, and WoS) using a combination of MeSH terms and text words, and relevant synonyms, spelling variations, and acronyms as appropriate. To identify grey literature, we used electronic databases such as Opengrey.eu and Google Scholar, and we hand-searched the references of those relevant studies identified. We contacted experts in each country, who are also part of the broader STRiDE team, to check for omissions and unpublished data. These experts were asked to identify and forward any known dementia prevalence literature (peer-reviewed or not). Experts were not asked to apply any eligibility criteria, which was undertaken by two of the authors (NF and AI) during the study selection process.

We adopted a comprehensive lateral search strategy, in which we explored citations from identified articles, but also previous reviews that explored this topic, for example the World Alzheimer Report 2015 (Prince et al., 2015). We also explored citation searches using the "Cited by" option on Google Scholar, and the "Related articles" option in PubMed.

For potentially relevant conference proceedings we contacted the corresponding author (where possible) to obtain access to the original data and information when needed. In addition, corresponding authors were contacted to obtain full-texts where not available online, or through our academic library systems.

Search Strategy

We adopted a broad yet specific search criteria, which we piloted before use. The search strategy included terms related to: 1) the health condition of interest (dementia), 2) Type of study (prevalence OR epidemiology) and 3) Countries of interest ("South Africa" OR Indonesia OR India OR Jamaica OR Mexico OR Brazil OR Kenya)

For the exact searches used for each database, see Appendix A.

Study Records

All search results were downloaded and entered into Mendeley, for automatic and manual de-duplication. The de-duplicated list of studies was then uploaded to a web platform (https://rayyan.qcri.org/) (Ouzzani et al., 2016), which allowed for titles and abstracts to be screened by two researchers independently.

Google Translate was used to translate any non-English language text, with language assistance from members of the broader multi-lingual STRiDE team from each country as needed.

Study Selection

At the screening stage, two researchers (NF and AI) independently examined titles and abstracts to see if they met inclusion criteria. In any cases of uncertainty, we included the study in the full-text phase (below). We collected the full-texts of all potentially eligible studies, and the two reviewers (NF and AI) independently established eligibility applying the full inclusion/exclusion criteria, tracking decisions using a pre-piloted form and dedicated table. During the shortlisting stage there was moderate agreement (κ=0.79). Discrepant decisions were discussed between NF and AI; if no consensus was reached then it was resolved through discussion with two senior researchers (SB and EA). In situations where there were multiple full-texts related to a single study (e.g. same data set), an original full-text was selected to be the primary source of information.

Data Abstraction

Data, defined as any information about (or deriving from) a study, were extracted from the full-texts of each included study using two sets of purposively designed, pre-piloted tables of: study design; characteristics of study delivery; main and secondary results; risk of bias; and study quality assessment. The extracted data were entered into an existing tool (The Joanna Briggs Institute, 2014), with additional items added to allow extraction of elements relevant to assessing risk of bias and study methodology specific to dementia prevalence (number of phases, dementia diagnostic criteria etc.). As the purpose of this review was to gain insight into the current state of the literature, including reporting styles, no efforts were made to contact authors for supplementary materials or clarifications outside of what was reported.

Data Items

For unweighted prevalence, we extracted either:

1) numerator and denominator,
2) prevalence and denominator,
3) prevalence and standard error, or
4) prevalence and 95% confidence intervals.

For weighted prevalence we extracted either:

1) weighted prevalence and weighted standard error, or
2) weighted prevalence and weighted 95% confidence intervals.

Studies were presented in different formats, either as a whole sample, gender-stratified, age-stratified, or a combination of them. We prioritised the extraction of whole sample raw prevalence data and extracted gender- and age-stratified prevalence data when available.

Descriptive information about the methodology and outcomes used in the included studies were extracted, such as sampling strategies, sample size, response rates and diagnostic criteria.

Outcomes and Prioritisation

The primary outcome of this systematic review was dementia prevalence.

Risk of Bias in Individual Studies

Risk of bias of the included studies was assessed using an existing tool for prevalence studies (Hoy et al., 2012). This has 10 domains, covering internal and external validity aspects of the studies. A single author (NF) judged each item (High vs Low Risk) based on predefined criteria. A second author (AI) reviewed the decisions, and any disagreements were discussed within the broader group. This tool was selected because it has been deemed as being easy to use, has good inter-rater agreement (κ =0.82) (Hoy et al., 2012) and has been adopted in previous prevalence-related systematic reviews (e.g.(Lundorff et al., 2017; Stolwijk et al., 2016)).

As per the guidance of the tool, any studies in which there was insufficient information to permit a judgement on an item was deemed as high risk. The final risk-of-bias rating of each study was selected based on the sum of decisions of each item. As the final risk-of-bias score has little guidance, we devised an algorithm to guide the decision-making process. Additional evidence of bias (e.g. abnormal prevalence rates) could be used as rationale to change the final risk-of-bias score. The criteria were:

- High risk of bias – Three or more items (≥75%) within the external validity domain OR four or more items (≥75%) within the internal validity domain being judged as having a high risk of bias.
- Low risk of bias – Fewer than two items judged as high risk within the external validity domain AND fewer than three items judged as high risk within the internal validity domain.
- Moderate risk of bias – All other scenarios.

The risk-of-bias tool was used for descriptive purposes and to formally explore sources of heterogeneity across studies. It is important to highlight that the scores only reflect information reported in each record and may not reflect the actual risk of bias of a study. Due to the nature of the tool, shorter reports are likely to have higher bias.

Summary Measures

Dementia prevalence (and 95% confidence intervals) was used as the summary measure.

Data synthesis

Descriptive data and risk of bias were reported for all included studies. A narrative synthesis of the findings was presented, grouped by country. Depending on the number of studies included in each country, data were synthesised using a series of meta-analyses to calculate pooled estimates of prevalence (double-arcsine) and 95% confidence intervals (CIs) in each of the countries using random effects models. A complementary set of heterogeneity statistics (Cochran's Q, tau^2, χ^2 and I^2) were reported between studies in each country where a meta-analysis was used (Higgins & Thompson, 2002; Huedo-Medina et al., 2006). We used existing categorisation to guide the interpretation of the heterogeneity (i.e. I^2 >75 indicates high heterogeneity) (Higgins et al., 2003). No efforts were made to reduce the heterogeneity reported using exploratory statistics. However, efforts were made to split the meta-analyses into subgroups (e.g. based on diagnostic criteria) whilst also potential *post hoc* explanations for heterogeneity between studies were considered.

Confidence in Cumulative Evidence

There are no standardised or widely adopted tools to assess confidence in cumulative evidence in prevalence studies, and therefore we did not describe this.

Results

Results of the search

Our search was completed on 30th April 2019. A total of 820 records were initially identified. Twenty-two records were also identified through lateral searches, and input from country-specific researchers of the STRiDE team. Following de-duplication there were 461 records remaining. Following the screening of the abstract and title, 365 records were deemed to not have met the inclusion criteria. We were unable to access three records (two conference proceedings, one thesis). The full-texts of 93 records were screened (Figure 1).

Included Studies

A total of 30 studies (50 records) were included in this review. Seven studies were from Brazil, 16 from India, three from Mexico, two from Jamaica, and two from South Africa. (One study reported on multiple countries). There were no studies for Kenya or Indonesia that met the inclusion criteria.

Across the included studies, DSM-IV (and DSM-IV TR) was the most commonly used for dementia diagnosis. The most frequently adopted study design was a two-phase survey: screening followed by diagnosis. Identifying outcome measures captured in each study was difficult, due to variations in reporting style. There is considerable variation in the types and detail of measures used. There was a general tendency to capture domains of cognition, neuropsychiatric symptoms and function. Person-centred outcomes (e.g. quality of life) and carer-related information were generally lacking across studies. Importantly, there was a lack of transparency on the language format of the questionnaires, and whether they had been cross-culturally adapted for use within their country-specific context.

Full descriptive details of the studies and their methodologies are presented in Appendix B.

Excluded Studies

A total of 43 records were excluded. Records were most frequently excluded because they did not apply an appropriate diagnostic criterion for dementia (n=15) or did not specifically report dementia prevalence data (n=8). See Appendix C for a list of excluded records.

Whilst there were a number of studies excluded from India, Brazil and Mexico, it is worth highlighting potentially relevant studies that did not meet our inclusion criteria from countries that are underrepresented in the literature more broadly (i.e. Kenya, Jamaica, Indonesia, and South Africa).

In Kenya, a monograph was identified which included the prevalence of dementia. However it was excluded because the authors used performance on a single cognitive instrument alone as a means to define dementia (Ndetei et al., 2013). This could account for why such a high percentage of the sample (44%) had 'probable dementia' (n=48) or a 'diagnosis of dementia' (n=61). In a more recent report, 15.9% (n=1,235) of participants were diagnosed with dementia (Mutiso, 2016); the report was excluded because it was unclear about the age of participants, how they were recruited, or what diagnostic criteria were utilised.

In Indonesia, a study (Hogervorst et al., 2011; Yesufu, 2009) was excluded because it appeared that the sampling frame was created 3 years prior to testing, whilst recruitment also seemed to be dependent on the sample having access to healthcare services. The authors reported that 4.1% of people over the age of 60 had possible dementia across urban and rural areas (Jakarta, Sumedang and Borobudur). Another study of people aged ≥ 60 living in Yogyakarta found that 20.1% of people were diagnosed with dementia (Suriastini et al., 2017). This study was excluded because we judged the diagnostic criteria lacked face validity.

Finally, in South Africa, an older study identified that 8.6% of older adults in Cape Town had dementia (Ben-Arie et al., 1983). However, this study was excluded because dementia was defined

solely by MMSE score and was deemed to be non-representative due to only recruiting a Coloured[1] sample.

Risk of Bias of Included Studies

External Validity

The most frequent item judged as having high risk of bias was related to whether the study target population was a close representation to the national population. Nearly all studies were limited to a specific geographical area, commonly urban areas. Even when authors attempted to recruit from a representative sample, there was a lack of explicit evidence that the sample closely represented the national population. Only one study was judged as of low risk in relation to the close representation item (Eldemire-Shearer et al., 2018).

Many studies were judged to have a high risk of bias regarding how closely representative the sample frame was to the target population (Banerjee et al., 2008; Caramelli et al., 2009; de Jager et al., 2017; Jacob et al., 2007; Llibre Rodriguez et al., 2008; Neita et al., 2014; Seby et al., 2011; Shaji et al., 1996, 2005; Tiwari et al., 2013; Van Der Poel et al., 2011; Vas et al., 2001), with studies failing to clearly report how they chose their sampling frame or selecting a frame out of convenience. Non-response bias was also frequently judged to constitute a high risk of bias, due to authors either not stating the study response rate or, when the response rate was low (<75%) whether there was any non-response bias (Banerjee et al., 2008, 2017; Bottino et al., 2008; Caramelli et al., 2009; Cesar et al., 2016; de Jager et al., 2017; Eldemire-Shearer et al., 2018; Gurukartick et al., 2016; Llibre Rodriguez et al., 2008; Lopes et al., 2012; Neita et al., 2014; Singh et al., 2008; Velazquez-Brizuela et al., 2014).

For the random selection of participants within the frame, the majority of studies were judged to have a low risk of bias because either a census was utilised, or randomisation occurred.

Internal Validity

Internal validity items across the studies were generally judged as having low risk of bias. The numerator and denominator item were occasionally judged as having high risk of bias because the authors did not report numerators and denominators sufficiently within the records, or the studies lacked clarity about why numbers in tables were not consistent.

Total

[1] Coloureds is an official term to refer to a distinct ethnic group in South Africa.

Across the studies, only six were deemed to have low risk of bias: two in Brazil (Herrera et al., 2002; Scazufca et al., 2008), three in India (Chandra et al., 1998; Das et al., 2006; Rajkumar & Kumar, 1996), and one in Mexico (Cruz-Alcalá & Vázquez Castellanos, 2002). Thirteen studies were judged to have moderate risk of bias, and 10 studies were judged to have high risk of bias overall. Both Jamaica and South Africa did not have any studies that were deemed as low risk of bias. The risk of bias assessments were upgraded to 'high risk' in several studies (Caramelli et al., 2009; Cesar et al., 2016; Magalhães et al., 2008) with a high prevalence of dementia in their sample (>15%), indicating that these estimates would likely change with the addition of new data.

Prevalence of dementia

Reported below is the prevalence of dementia for each study split by country. Unless otherwise specified, prevalence rates are reported for samples aged ≥ 60, based on DSM-IV diagnostic criteria.

Brazil

Seven studies from Brazil were included (Bottino et al., 2008; Caramelli et al., 2009; Cesar et al., 2016; Herrera et al., 2002; Lopes et al., 2012; Magalhães et al., 2008; Scazufca et al., 2008). Of the seven studies, five were conducted in the state of São Paulo.

Of the five studies in São Paulo state, four were urban and one urban and rural. The estimated dementia prevalence varied from across these. (i) Scazufca et al., (2008) reported 5.1% (4.1-6.0) in those aged ≥ 65 years old (n=2072); (ii) Lopes et al., (2012) reported 5.9% (4.6-7.2) in Ribeirão Preto (n=1145); (iii) Bottino et al (2008) reported 6.8% (5.6-8.0) (n=1,563); and (iv) Herrera et al., (2002) reported 7.1% (6.0–8.5) amongst 1,656 older adults (≥ 65 years old) from the urban region of Catanduva. The study in urban and rural areas of Tremembé, Cesar et al (2016) reported an estimated prevalence of 17.5% (14.6-20.6) of older adults (n=630). This higher prevalence could be due to the bias introduced by having a modest response rate of the initial sample (56.9%).

From the two studies originating outside of São Paulo state, prevalence rates were substantially higher. In an urban and rural region of Caeté (Minas Gerais state), there was an estimated dementia prevalence of 27.5% (24.1-31.1), albeit within a sample of older adults aged over 75 years old (n=639) (Caramelli et al., 2009). In a rural area of Santo Estevão (Bahia state), there was an estimated prevalence of 49.6% (45.0-54.1), using the CAMDEX tool (Magalhães et al., 2008). It was unclear whether this was in accordance with DSM-IV criteria.

Across the studies there was a pooled prevalence of 14.3% (6.8-23.9). However there was evidence of substantial heterogeneity, I^2= 99.14, χ^2 $p < 0.001$, $tau^2 = 0.10$. A large amount of heterogeneity was introduced through the diagnostic criteria used. Studies that used DSM-IV criteria had only moderate

heterogeneity (I^2=64.6, χ^2 p = 0.04, tau^2 = 0.001), and had a pooled prevalence of 6.2% (5.2-7.3). See Figure 2.

India

Fifteen studies were identified from India (Banerjee et al., 2008, 2017; Chandra et al., 1998; Das et al., 2006; Gurukartick et al., 2016; Jacob et al., 2007; Llibre Rodriguez et al., 2008; Mathuranath et al., 2010; Rajkumar & Kumar, 1996; Seby et al., 2011; Shaji et al., 1996, 2005; Singh et al., 2008; Tiwari et al., 2013; Vas et al., 2001).

Generally, dementia prevalence was estimated in urban settings, with Kolkata being the most common setting. In one such study, 2,720 participants in the urban region of Kolkata were surveyed, with an estimated dementia prevalence of 1.3% (0.9-1.7) (Banerjee et al., 2008). Similarly, 1.1% of older adults (n=8,542) were reported to have a diagnosis of dementia in Kolkata (Banerjee et al., 2017). In another study within Kolkata, there was a prevalence of 0.8% (0.6-1.1) in a sample of 5,430 older adults (Das et al., 2006). Outside of Kolkata, there have been several studies to explore the prevalence of dementia in other urban samples. Mathuranath and colleagues estimated the prevalence of dementia in Trivandrum (n=2,422) at 3.8% (Mathuranath et al., 2010). In Channai, an estimated prevalence of 2.7% was reported in those aged 65 and over (n=1300) (Rajkumar & Kumar, 1996). However, a more recent study in Chennai (n=1005) estimated prevalence at 0.9% (0.3-1.5) in those aged 65 and above using DSM-IV criteria, though it was substantially higher using the 10/66 algorithm with an estimate of 7.5% (5.8-9.1) (Llibre Rodriguez et al., 2008). In Kochi, 2.9% aged 65 years and above (n=1934) were reported to be identified with having dementia (Shaji et al., 2005). In Mumbai, 6,041 older adults were surveyed, in which 1.6% were identified with having dementia (Vas et al., 2001). Whilst in an unnamed urban region in North Western India (n=1376), there was an estimated prevalence of 3.0% (2.6-4.3) (Singh et al., 2008), though other data were unavailable as we were only able to access a conference proceeding. The only study to have a somewhat higher prevalence was reported in the urban region of Wanowarie Bazaar (Seby et al., 2011). For those ≥ 65 years old, there was an estimated prevalence of 14.9%. Methodologically, there is no clear reason why this would be the case, though it could be attributed to the limited sample size (n=202) or the use of ICD-10 diagnostic criteria.

In the rural region of Tamil Nadu, there was an estimated prevalence of 0.8% (0.4-1.6) for those aged ≥ 65 (n=1,000) using the DSM-IV criteria, but was 10.6% (8.8-12.7) using the education-adjusted 10/66 algorithm (Jacob et al., 2007). The AGECAT dementia prevalence rate was very high (63.47%), though this was not discussed within the article. In a rural region of Ballabgarh, there was an estimated prevalence of 1.4% of those aged ≥ of 65 years old (n=2715) (Chandra et al., 1998). In the Lucknow district 2.8% of older adults (n= 2,146) were estimated to have dementia (Tiwari et al.,

2013). In the rural region of Villupuram District, there was an estimated prevalence of 3.1% in people 65 years old and above (n=1,304) (Gurukartick et al., 2016). The rural region of Thiruvaniyoor Panchayath (n=2,067) reported a prevalence of 3.2% based on the DSM-III-R (Shaji et al., 1996), whilst in Thiruporur (n=750), 3.5% of the same age group were reported to have dementia based on the AGECAT (Rajkumar & Kumar, 1996).

The initial pooled prevalence was 4.4% (2.2 -7.2), with evidence of substantial heterogeneity between studies (I^2 = 99.4, Cochran's Q = 2868.67, χ^2 p = <0.0001, tau^2= 0.07). The diagnostic criteria appeared to contribute a portion of the heterogeneity reported. However, even within diagnostic criteria substantial heterogeneity was reported. Pooled prevalence ranged from 1.8% (1.3-2.4) based on the DSM-IV criteria, to 17.0% (0.0-66.0) based on the AGECAT. See Figure 3.

1.1.1.1 Indonesia

There were no studies that met the inclusion criteria for this review. Please see "Excluded Studies".

1.1.1.2 Jamaica

Two prevalence studies were identified from Jamaica (Eldemire-Shearer et al., 2018; Neita et al., 2014).

Neita and colleagues carried out a community survey of 200 older adults from two urban areas in Kingston, Jamaica (Neita et al., 2014). Dementia was diagnosed in 6.5% (3.4-10.4) based on DSM-IV criteria. In the study by Eldemire-Shearer and colleagues, a national survey of 2,782 people aged 60 years and above were recruited. A random sample of 301 participants (158 cases with MMSE < 20, 143 controls with MMSE>20) were subsequently assessed for dementia using the DSM-IV. Based on the raw data 11.4% (8.0-15.3) of participants had a diagnosis of dementia. The authors also noted that applying the anticipated number of cases of dementia in each group to the whole sample (n=2782), would yield a prevalence of 5.9%.

There was a pooled prevalence of 8.8% (4.6-14.2). There was some indication of moderate heterogeneity between the two studies (I^2 = 70.78, Cochran's Q = 3.42, χ^2 p = 0.06, tau^2= 0.01). See Figure 4.

1.1.1.3 Kenya

There were no studies that met the inclusion criteria for this review. Please see "Excluded Studies".

1.1.1.4 Mexico

Three studies were found to report dementia prevalence in Mexico (Cruz-Alcalá & Vázquez Castellanos, 2002; Llibre Rodriguez et al., 2008; Velazquez-Brizuela et al., 2014).

Within the urban region of Guadalajara, 9.5% (7.9-11.3) of people were diagnosed with dementia (Velazquez-Brizuela et al., 2014). In the 10/66 study (Llibre Rodriguez et al., 2008), participants aged 65 years and above were recruited from an urban (n=1,002) area of Mexico, with a dementia prevalence of 4.1% (2.8-5.3) using the DSM-IV criteria, and 8.6% (6.8-10.4) using the 10/66 algorithm. The only data derived from a rural area also came from the 10/66 study (Llibre Rodriguez et al., 2008), in which 2.2% (1.3-3.1) of the sample aged 65 years and above (n=1,000) were diagnosed with dementia based on the DSM-IV, but an estimated prevalence of 8.5% (6.7-10.3) using the 10/66 algorithm. A study from the urban region of Tepatitlan reported a prevalence of 0.33%, however this was across all ages of a larger cohort (n=9082), which did not provide a breakdown of these data (Cruz-Alcalá & Vázquez Castellanos, 2002). Due to insufficient information in this study did not be included in the pooled meta-analysis.

Overall the pooled DSM-IV prevalence was 4.7% (1.2-9.5), with evidence of substantial heterogeneity between studies (I^2= 96.70, Cochran's Q = 60.53, X^2 p< 0.001, tau^2 = 0.03). Whilst pooled 10/66 algorithm prevalence was 8.4% (7.4-9.9). See Figure 5.

1.1.1.5 South Africa

Two studies from South Africa were included in this review (de Jager et al., 2017; Van Der Poel et al., 2011). In the first study of 205 older adults (≥ 65 years) from central South Africa, authors identified a dementia prevalence of 6.4% using DSM-IV criteria. We were unable to extract numerators or denominators for the whole sample, or split by gender, age or combination of both. Similarly, the authors reported that the prevalence of dementia according to the 10/66 algorithm was "unusually high". The authors were unable to provide additional data at this stage.

In the second study (de Jager et al., 2017), 1,382 Xhosa-speaking community-dwelling older adults (≥ 60 years) were recruited from three catchment areas in an unnamed location within the Eastern Cape. The authors estimated that 7.6% (6.3-9.1) of participants had dementia, using the 10/66 short diagnostic schedule.

Discussion

This systematic review set out to understand the prevalence of dementia across the seven STRiDE countries and the methodologies used to generate this evidence. Whilst there were no eligible studies from Indonesia and Kenya, 28 studies spanned the remaining STRiDE countries. India and Brazil had the largest number of studies included in this review.

Pooled meta-analyses within each country, based on DSM-IV, revealed that dementia prevalence rates ranged from 2% (India) to 9% (Jamaica). This is in line with global estimates of dementia, sitting at 5.2% (Prince et al., 2015). Due to the general absence of included studies and data outside of India, we did not pursue meta-analysis split by other potential factors (age, gender or setting). It is likely that splitting the meta-analysis based on these factors would reduce some heterogeneity observed between studies, and that more heterogeneity might exist due to variation in study design, outcomes and diagnostic criteria. It should be noted that four studies introduced sizable heterogeneity into the meta-analyses, due to having small sample sizes and high prevalence rates (Caramelli et al., 2009; Cesar et al., 2016; Magalhães et al., 2008; Seby et al., 2011). Two of these studies (Magalhães et al., 2008; Seby et al., 2011) fell short of a sample size needed to estimate a true prevalence of 6% with a precision of ±2.1% (Prince et al., 2015).

The quality of studies included in this review was mixed, with a fifth (6/28) being judged as having a low risk of bias overall. Bias was commonly introduced through potential issues in external validity. Notably, the majority of studies adopted sampling techniques that minimise bias (e.g. random cluster sampling, all sectors within region, representative sectors); however, the authors did not explicitly state how representative their sampling frame was compared to the national picture. For example, prevalence studies in Brazil predominately originated in the southeast of the country. Another common item judged to have high risk of bias was the presence of non-response bias. Non-response can introduce a source of variation, and limit the representativeness of findings, with the reason for non-response (refusal, death/illness, moving home) affecting the characteristics and estimated prevalence of these non-response groups (Boersma et al., 2015). This could particularly be an issue in multiphase designs, as it can lead to underestimation of the prevalence of dementia and overestimation of precision (Prince, Bryce, et al., 2013). Two phase designs were most commonly adopted in studies included within this systematic review. Whilst language of diagnostic assessments was not of particular focus in this systematic review, it is also important to highlight the countries where language is strongly associated with specific ethnicities or regions, language may indirectly impact sample representativeness.

For inclusion in this review, studies were required to have a diagnostic criterion with face validity (consensus amongst authors). As such, there were a number of studies that were excluded because they used single cognitive impairment and/or functional tools to diagnose dementia. Among the included studies, DSM-IV criteria were frequently used to make a dementia diagnosis, which was

reliant on hiring clinicians or utilising the CAMDEX toolkit. Within countries where a variety of diagnostic criteria were utilised, there was evidence that this introduced heterogeneity into the findings. This was evident in studies derived from the 10/66 group (Jacob et al., 2007; Llibre Rodriguez et al., 2008; Van Der Poel et al., 2011) which adopted multiple diagnostic criteria, and therefore produced multiple dementia prevalence rates. For example, the AGECAT estimated a prevalence of 63.4%, the 10/66 algorithm (education-adjusted) estimated dementia prevalence at 10.6%, whilst the DSM-IV prevalence was 0.8% (Jacob et al., 2007). It is evident that diagnostic criteria employed are important determinants of prevalence estimates.

It should be noted that for a single study (de Jager et al. 2017) there was some discussion about its inclusion based on the diagnostic criteria used – the short version 10/66 algorithm. Despite being a relatively new diagnostic algorithm, recent evidence supports its validity across a number of settings (Abdin et al., 2017; Bernardo Seinhart et al., 2016; Stewart et al., 2016). For example, the short version 10/66 algorithm shows substantial agreement with clinical diagnosis of dementia (kappa = 0.70, AUC = 0.87) (Abdin et al., 2017). However, similar to the full 10/66 algorithm, the short version tends to estimate a higher rate of prevalence compared to the DSM-IV, which could be due to the DSM-IV dementia criterion underestimating dementia prevalence (Prince, 2009). Whilst the short version 10/66 algorithm (and the brief CSID from which it is derived) may appear to be less comprehensive compared to other methods for identifying dementia, it is important to recognise that there is an important place for algorithms that are both less time-intensive and do not require clinical training to administer.

A strength of this review was that we were able to capture all but two studies reported in the World Alzheimer's Report 2015 (Prince et al., 2015) despite having slightly different inclusion and exclusion criteria. We were also able to identify an additional 15 studies that were not identified in the World Alzheimer's Report 2015, partly because the search was more recent, but also because we enquired directly for studies within each country. This review is, however, limited in that it only covers the seven STRiDE countries, which prevents us making conclusions regarding the literature in other MICs. As highlighted within the section on risk of bias, another limitation of this systematic review is that it reflects data and information published (though not necessarily peer-reviewed), and therefore it may be that additional detail may exist but was not explicitly reported within the identified records.

Conclusions

There is substantial evidence of variability in terms of methodologies used to estimate dementia prevalence, making prevalence rates difficult to compare within and between countries. There is also

wide variation within and between the countries in terms of risk of bias introduced by study designs (or how they are reported).

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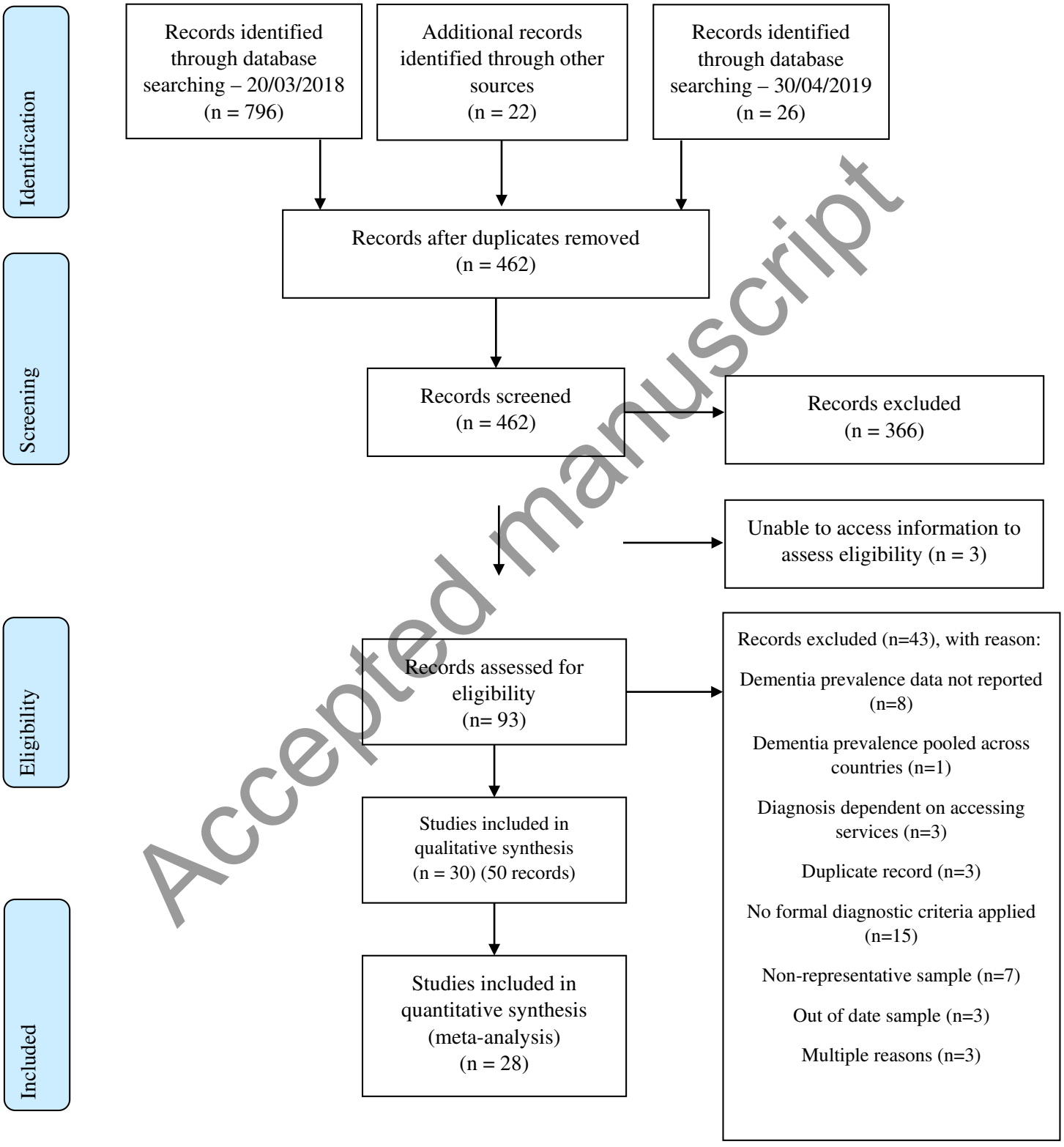
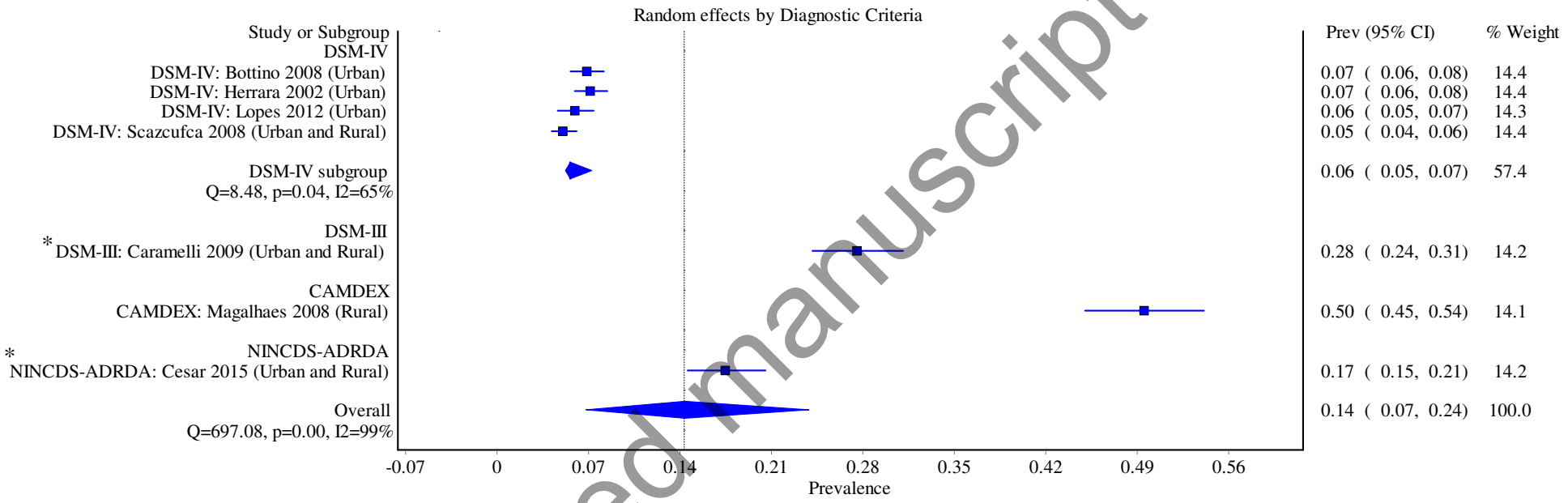


Figure 1. Flow chart of systematic review process.

Figure 2. Dementia prevalence estimates within Brazil, split by diagnostic criteria.



*As per citation in full-text.

Figure 3. Dementia prevalence estimates within India, split by diagnostic criteria.

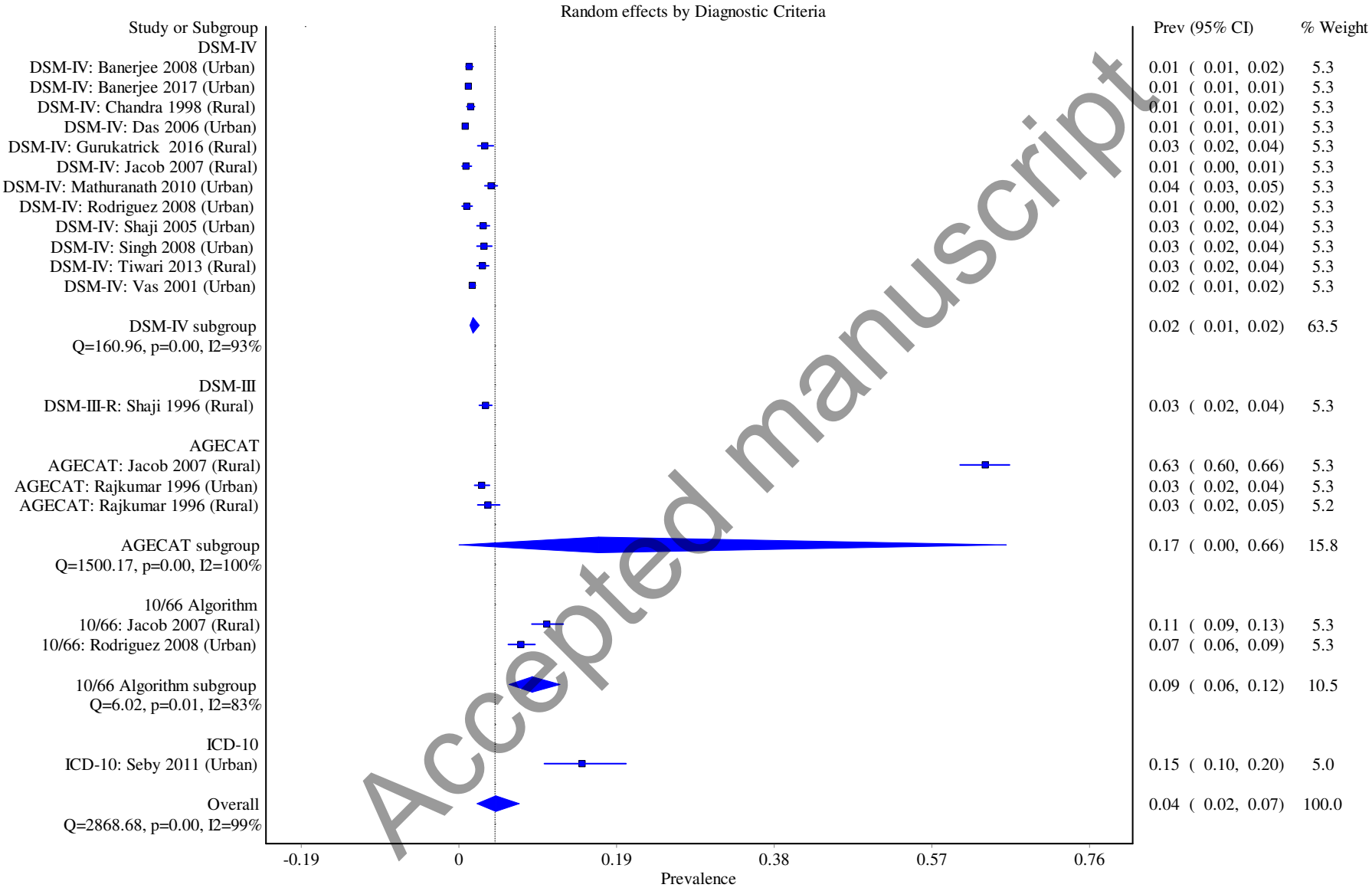


Figure 4. Dementia prevalence estimates within Jamaica.

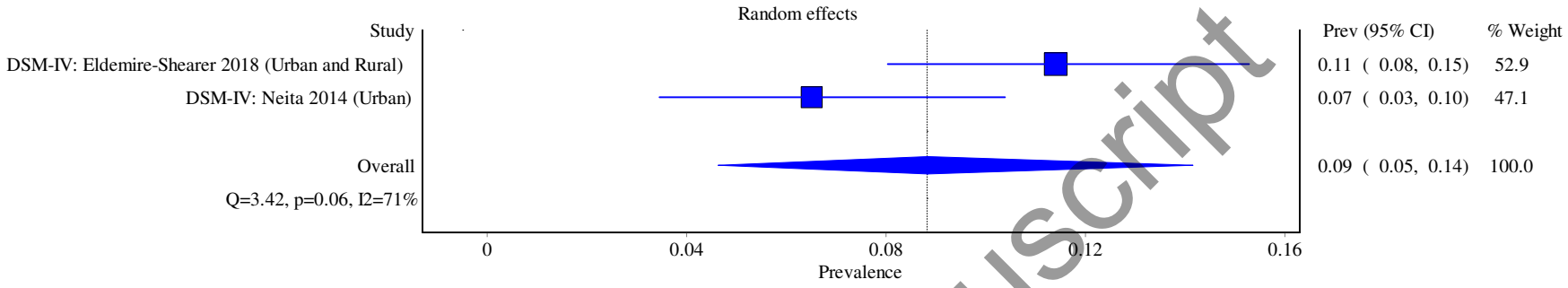
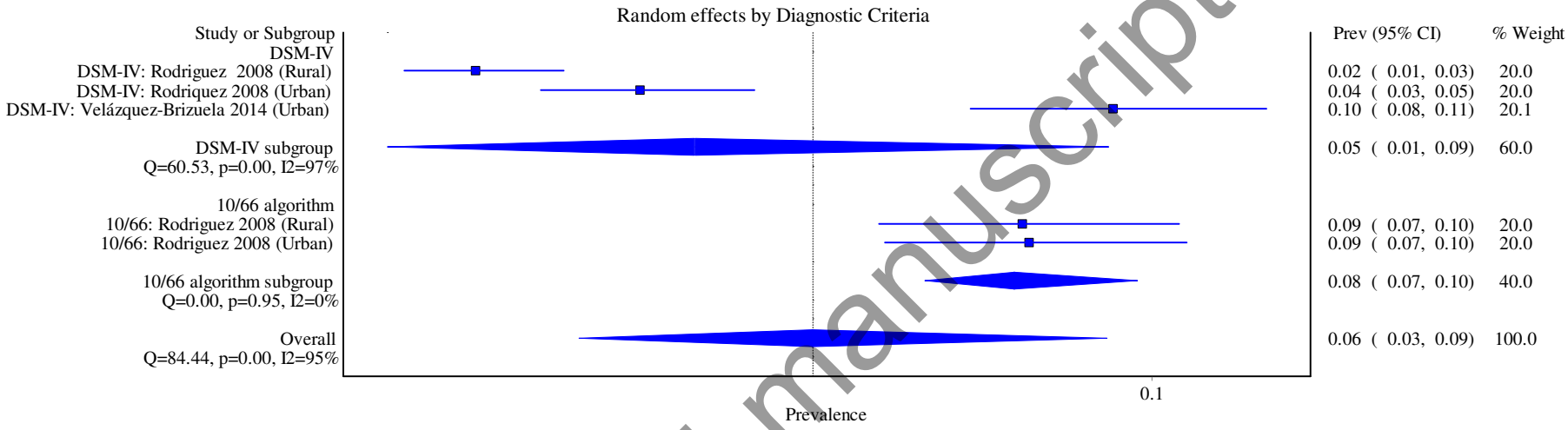


Figure 5. Dementia prevalence estimates within Mexico, split by diagnostic criteria.



Appendix A

Search strategy and associated hits

Scopus

- TITLE (dementia) AND TITLE-ABS (prevalence OR epidemiolog*) AND TITLE-ABS ("South Africa" OR indonesia OR india OR jamaica OR mexico OR brazil OR kenya)
- 127 hits, 20/03/18
- 4 hits, 30/04/19

PsycINFO

- ((TI(dementia)) AND (prevalence OR epidemiolog*) AND ("South Africa" OR indonesia OR india OR jamaica OR mexico OR brazil OR kenya))
- 172 hits, 20/03/18
- 2 hits, 30/04/19

Web of Science

- TI= (dementia) AND TS= (prevalence OR epidemiolog*) AND TS= ("South Africa" OR indonesia OR india OR jamaica OR mexico OR brazil OR kenya)
- 173 hits, 20/03/18
- 7 hits, 30/04/2019

Pubmed:

- ((dementia [Title] OR dementia [MeSH Terms]) AND (epidemiolog* [Title/Abstract] OR epidemiology [MeSH Terms] OR prevalence [MeSH Terms] OR prevalence[Title/Abstract])) AND ((“South Africa" [Title/Abstract] OR indonesia [Title/Abstract] OR india [Title/Abstract] OR jamaica [Title/Abstract] OR mexico [Title/Abstract] OR brazil [Title/Abstract] OR kenya[Title/Abstract]))
- 219 hits, 20/03/18
- 8 hits, 30/04/2019

SciELO:

- ((prevalence OR epidemiolog*) AND (mexico OR brazil OR jamaica)) AND (ti:(dementia))
- 23 hits, 20/03/18
- 2 hits, 30/5/18

Opengrey.eu

- Dementia AND prevalence
- 27 hits, 20/03/2018
- 0 hits, 30/05/2019

Google Scholar:

- allintitle: dementia prevalence "South Africa" OR indonesia OR india OR jamaica OR mexico OR brazil OR Kenya
- 55 hits, 20/03/18
- 3 hits, 30/04/2019

Appendix B

Description of included studies.

Author	Record ID	Sample size	Key Inclusion Criteria	# of phases	Setting	Sampling Frame	Participant Identification	Study measures	Language(s)	Diagnostic criteria
Brazil										
Bottino	13480301 13480300 15752111	1563	Aged ≥ 60	2	Urban	"A cluster random sampling of a population of individuals aged 60 years and over from three different socioeconomic classes (upper, middle and low) was used in Sao Paulo"	"…blocks of 10 domiciles were randomly chosen in each of the 90 selected census sectors."	• MMSE • FOME • IQCODE • BADL • CAMDEX • CAMCOG	NR	DSM-IV
Caramelli	15752121	639	Aged ≥ 75	3	Both (Caramelli, 2009)	"Since a complete and updated list of these elderly individuals was not readily available, an active search was undertaken. We contacted family health program agents from the municipal government and the municipality health department."; "As for institutionalized elderly, the two existing institutions in town were visited by the research team."	NR	• UPDRS-part III • MMSE • Brief Cognitive Screening Battery • Pfeffer Functional Activities Questionnaire • FAST • GDS • Mini International Neuropsychiatric Interview • Rey Auditory Verbal Learning Test	NR	DSM-III (as cited within text)

								• Naming and praxis tests from the CERAD protocol • Verbal Fluency Task (FAS) • FAB • Physical and Instrumental-Self Maintenance scale • CDR • CSDD		
Cesar	13480321 N001 13280322 N003	630	Aged ≥ 60	1	Both	"According to IBGE there are 89 sectors (73 urban and 16 rural) in Tremembe´. Each census sector defined by IBGE is a territorial unit with identified physical limits in continuous areas, accounting for uniform households' numbers (usually 400 to 450 dwellers in each one). Twenty percent of the households with individuals aged 60 years or more were randomly selected from each of the municipality's census sectors, to obtain a homogenous representation of all regions and districts representing all socioeconomic and cultural levels."	"Twenty percent of the households with individuals aged 60 years or more were then randomly selected, from both urban and rural areas…"	• MMSE • Brief Cognitive Screening Battery • IQCODE • Pfeffer Functional Activities Questionnaire • ACE-R • MoCA • QMC22 • Verbal fluency test and clock drawing. • CSDD • PRIME-MD	NR	"Dementia was diagnosed based on clinical criteria updated by the National Institute on Aging according to criteria of McKhann et al for the diagnosis of all-cause dementia and recommended by the Brazilian Academy of Neurology."

Herrera	15752058	1656	Aged ≥ 65	3	Urban	"At the beginning of the study, the Brazilian Institute of Geography and Statistics had recently finished a door-to-door census of the city. From this census, we were informed about the domiciles, in each of the city's districts, where persons aged 65 years or more resided and how many lived in each house. According to these data, we estimated that about 6,800 possible subjects lived in 5,153 houses." "To investigate 1,700 persons, we selected every fourth address from each subdistrict list of addresses, so as to screen 25% of the domiciles." "To know if institutionalization of patients with dementia was a common practice in the community, which would interfere with the prevalence rate, all nursing home residents aged 65 years or more were also included min the survey."	"To investigate 1,700 persons we selected every fourth address from each subdistrict list of addresses, so as to screen 25% of the domiciles… all nursing home residents aged 65 years or more were also included min the survey."	• MMSE • Pfeffer Functional Activities Questionnaire • Hachinski Ischemic Scale • CDR • Routine blood tests	Portuguese	DSM-IV
Lopes	13480416 13480414 13480413 13480379	1145	Aged ≥ 60	2	Urban	"The cluster-sampling strategy aimed to include representative people from different socioeconomic levels, selected from three census units from three	"…the cluster-sampling strategy aimed to include representative people from different socioeconomic levels, selected from three	• MMSE • FOME • IQCODE • BADL • CDR (see Lopes 2005)	Portuguese	CAMDEX (DSM-IV)

						different regions according to a socioeconomic "score" (based on income and schooling)."	census units from three different regions according to a socioeconomic "score" (based on income and schooling). This selection followed operational and population criteria, such as referral of positive cases, correspondence between the density of elderly people in the region and the census unit and socioeconomic rank."	• ADL-IS (see Lopes 2005) • CAGE (see Lopes 2007)		
Magalhaes	15752146	466	Aged ≥ 60	1	Rural	"The studied population includes all individuals aged 60 or above living in Lagoa Pequena"	"The studied population includes all individuals aged 60 or above living in Lagoa Pequena"	• CAMDEX	Portug uese	CAMDEX
Scazufca	13480493 13480488 13480494 15752170 N010	2,072	Aged ≥ 65	1	Urban	The present investigation was carried out in the borough of Butanta, located on the west side of the city."	"All eligible subjects were invited to participate, regardless of whether or not other older adults"	• CSI-D • An adapted version of the CERAD • Geriatric Mental State • HAS-DDS • "a structured neurological assessment to ascertain the presence of lateralizing signs, parkinsonism, ataxia,	NR	DSM-IV

								apraxia and primitive "release" reflexes."		
India										
Banerjee	8545180	53,907 (6,129 ≥ 50 years)	Aged ≥ 50	2	Urban	"The survey area comprised 4 adjacent municipal wards (wards 66, 67, 91 and 107) located in the southern part of the city"; "survey of all the inhabitants of the survey area was conducted"	"…survey of all the inhabitants of the survey area was conducted"	• Kolkata Cognitive Test Battery • GDS • EASI • CDR	NR	DSM-IV
Banerjee	13480294	17,584	Aged ≥ 50	2	Urban	"The survey was conducted on a stratified, randomly selected sample of 100,802 subjects (53,209 men; 47,593 women). Municipal area of the city of Kolkata comprises 5200 smaller units known as National Sample Survey Organization blocks, with an average of 75–150 households per block. For purpose of our study, we divided the city into six sampling strata."; "From each stratum, multiple National Sample Survey Organization blocks (number proportionate to the population) were randomly selected."	"In each selected block, alternate houses were surveyed…"	• KCSB • GDS • Everyday Activities Scale of India • CDR	NR	DSM-IV

Chandra	13480326 13480447 15752072	5,126	Aged ≥ 55	2	Rural	"A total of 5,649 Ballabgarh residents were identified as being age 55 or older in the census database. Each of these individuals was visited at home by a project field worker."	"A total of 5,649 Ballabgarh residents were identified as being age 55 or older in the census database. Each of these individuals was visited at home by a project field worker."	• HMMSE • Immediate learning, delayed recall, and delayed recognition of a 10-item word list (adapted from the CERAD) • Verbal fluency • The Object Naming Test • Constructional praxis	Hindi	DSM-IV
Das	15752010 15752126 13480484	52,377 5,430 over the age of 60 (Das., 2008)	Aged ≥ 50	2	Urban	"Stratified random sampling was used for selecting the population. The KMC area was divided into six strata for the purpose of this study based on geographical location and type of dwellings. Each of this stratum acted as a sample frame."; "From each stratum, nearly equal number of blocks was selected by using statistical random number table. It was known that each NSSO block consisted of 100-150 households, and each household consisted of 4-5 members."	"We got the information of the total number of people living in each block, and surveyed 50 per cent of the households of each block by visiting alternate houses."	• General screening questionnaire • HMMSE	Hindi, Bengali	DSM-IV

Gurukartick	13480366	1,304	Aged ≥ 65	2	Rural	"A list of all the villages in the study area and their population was obtained from the local Block Development Office of Thiruvennainallur."	"…systematic random sampling was done to select the households in each village. In the selected house, a respondent (≥65 years) and one primary caregiver were selected. If there was more than one elderly person in the house, then one respondent was chosen by a lottery method. If there was no elderly person in the selected house, then the next adjacent house was selected."	• VSID-Patient version - Tool 1 • VSID-Informant version - Tool 2	NR	DSM-IV
Jacob	13480387 13480477	1,000	Aged > 65	2	Rural	"The surveillance system consists of a four-tier monitoring system. The block has been divided into regions with specific personnel in charge of the health of each region. The system involves the village health worker, the community health aide, the public health nurse and the doctor. "; "Data obtained by the surveillance system are computerized. The data for the whole block are collated and reviewed monthly by the entire health team consisting of the	"A list of residents aged over 60 years of age was retrieved from the computerized database. A door-to-door survey revealed a few additional elderly people who were living in the study area."	• GMS • CSID • Modified CERAD 10-word list learning task (Ganguli et al., 1996) • HAS-DDS • NPI • WHODAS II	Tamil	AGECAT 10/66 algorithm DSM-IV

						community health workers, health aides, community health nurses, doctors and other development staff."				
Mathuranath	13480423 15752110	2,466	Aged ≥ 55	2	Urban	"Sampling frame consisted of 41920 subjects from four of the eight wards (administrative districts of the city corporation) of Trivandrum. Residents of these four wards provided a good admixture and faithful representation of the socio-economically and culturally diverse population of Trivandrum."	"The census information and the Election Commission's database identified 2932 individuals to be 55 years of age." All approached in a "door knocking survey"	• ACE • An IADL-E was specifically developed for the local elders (Mathuranath et al., 2005).	Malay alam	DSM-IV
Rajkumar	13480469 13480470	Rural: 750 Urban: 1,300	Aged ≥ 65	2	Both	Rural: "The sample of 750 people 60 years of age and over was drawn using the cluster sampling technique." Urban: "Using the multistage stratified random sampling technique, 1,300 individuals 65 years of age and older were selected." (Electoral frame electoral frame)	Rural setting: "Door to door survey…All Elderly age 60 & > included" Urban setting: " Finally, using a simple random sampling procedure, people 65 years of age and older were selected from the electoral rolls sample size allotted to each parliamentary constituency was proportional to the population size and distributed between the	• GMS	Tamil	AGECAT

							selected divisions of each strata."			
Rodriguez	13480477 13243182 13480529	1,005	Aged ≥ 65	1	Urban	"Catchment area boundaries were precisely defined. Mapping was carried out to identify and locate all households, which were allocated household IDs. Households were enumerated to identify possible eligibles (aged 65 and over)."	"Households were enumerated to identify possible eligibles (aged 65 and over)."	• AGECAT • CSI-D COGSCORE • CSI-D RELSCORE • HAS-DDS • NEUROEX • NPI-Q • Self-report list of 12 common physical impairments • WHO-SAS II • Physical assessment • ZBI • Caregiver mental health (GHQ-20) • CAS • CSRI • Reproductive assessment • Blood tests	Tamil	10/66 algorithm DSM-IV
Seby	N010	202	Aged ≥ 65	2	Urban	"It is an urban area and the total adult population (18 years and above) of ward no six was 7239 as per the latest electoral rolls. This ward is divided into four parts or	"The total number of the adult population (18 years and above) residing in this area was 1965, of which 218 persons were aged 65 years	• GHQ-12 • MMSE • GDS-15 • CAGE questionnaire – alcohol problems	Hindi and English	ICD-10

						divisions, and this study was conducted in part II division of this ward. This particular area was chosen because it was already a field research area of the coordinating institute."	and above." All were approached			
Shaji	13480510	1,934	Aged ≥ 65	3	Urban	"The list of voters and the area map constituted the sampling frame. The Ernakulam constituency is divided into 178 parts, each of which has a population of 800–1000. For operational purposes, each part was designated as a cluster, and a cluster sampling technique was used."	"…in each [part] a door-to-door survey was conducted to identify residents aged 65 years and above."	• MMSE • CAMDEX Section B • CAMDEX Section H • The Socio-economic Status Scale – Urban (Kuppuswamy, 1976)	Malay alam	CAMDEX (DSM-IV)
Shaji	13480511	2,067	Aged ≥ 60	3	Rural	"The voters list and area map were taken from the administrative office and served as the survey frame. The study area was selected by considering its easy access by road, the stability of the population, and the cooperation of the rural administrative officials."	"A door to door survey was conducted in this area by surveyors to identify people aged 60 years or above…"	• MMSE • CAMDEX-Section B • CAMDEX-Section H	NR	DSM-III-R
Singh	13480516	1,376	Aged ≥ 60	NR	Urban	Cluster sampling.	NR	• MMSE	NR	DSM-IV

Tiwari	15752131	2,146	Aged ≥ 60	2	Rural	"The two rural revenue blocks- Malihabad and Bakshi Ka Talab of Lucknow district of the State of Uttar Pradesh in north India were randomly selected for the study location. There were 215 villages in these two rural blocks with approximate population of 4,52,598 and 300 to 500 houses in each village."	"Of these, 30 villages were randomly selected for the complete enumeration of the elderly aged 60 yr and above"	• Socio-economic status scale • HMMSE • SPAS • MDQ • SCAN • CAMDEX-R • Physical and Neurological Examination	Hindi	CAMDEX (DSM-IV and ICD-10)
Vas	13480548	24,488	Aged 40+	3	Urban	"The sample was determined from the electoral rolls of "H" Ward of the Municipal Corporation of Greater Mumbai Bombay)." "It has a population of approximately 151,000 persons and from these electoral rolls we identified 30,000 persons who were aged 40 or older in 1991 (the census year). Because the sample was selected from the electoral rolls, it included persons from all socioeconomic levels and different ethnic backgrounds."	All those on electoral roll (assumed).	• Modified Sandoz Clinical Assessment Geriatric Scale • MMSE • HMMSE • CAMDEX-A or H • CAMCOG • CDR	Hindi and Marathi	DSM-IV
Jamaica										
Eldemire-Shearer	157520466	2,943	Aged ≥ 60	2	Both	"…four parishes in Jamaica. These parishes are representative of the national population (based on age, gender and geographic	"…with each of the 35 clusters having 76 participants."	• MMSE • "The 1989 structured, pre-coded, paper-based questionnaire The	NR	DSM-IV

						distribution).” (Mitchell-Fearon et al.,2014)”		epidemiology of ageing in Jamaica [unpublished doctoral thesis].”		
Neita	13480438 13480439	200	Aged ≥ 60	2	Urban	“…low- and middle- income urban communities of August Town and Mona Heights”	“…100 participants each were randomly selected…”	• MMSE	NR	DSM-IV-TR
Mexico										
Rodriguez	13480477 13243182 13480529	Urban: 1,002 Rural: 1,000	Aged ≥ 65	1	Both	“Catchment area boundaries were precisely defined. Mapping was carried out to identify and locate all households, which were allocated household IDs. Households were enumerated to identify possible eligibles (aged 65 and over).”	“Households were enumerated to identify possible eligibles (aged 65 and over).”	• AGECAT • CSI-D • HAS-DDS • NEUROEX • NPI-Q • Self-report list of 12 common physical impairments • WHO-DAS II • Physical assessment • ZBI • Caregiver mental health (GHQ-20) • Caregiver Activity Survey • CSRI • Reproductive assessment • Blood tests	Ibero-American Spanish	1066 algorithm DSM-IV

Cruz-Alcala	N016	9,082	Not reported	2	Urban	"The city was divided into 37 conglomerates, from which, by chance, 28 of them were selected." "In each conglomerate one out of every four dwellings was systematically selected, to obtain an average of 71 per conglomerate."	"…one out of every four dwellings was systematically selected, to obtain an average of 71 per conglomerate" [translated]	• "a questionnaire designed to detect suspects of neurological diseases was applied"	Spanish	DSM-IV
Velazquez-Brizuelu	13480552 N015	1,142	Aged ≥ 60	2	Urban	"The study was conducted in the metropolitan area of Guadalajara (GMA), Mexico, which includes the city of Guadalajara and its surrounding municipalities: El Salto, Tlajomulco, Tlaquepaque, Tonala, and Zapopan. The six municipalities of GMA are subdivided into 14 urban basic geostatistical areas (UGEA)."	"Locating the block, we proceed at the southwest corner clockwise until we find an adult 60 years or more."	• MMSE • GDS • Katz Index	Spanish	DSM-IV
South Africa										
Van Der Poel	113480542	205	Aged ≥ 65	NR	NR	NR	NR	• "10/66 Dementia Research Group's core minimum data set"	Sesotho	DSM-IV 10/66 algorithm
De Jager	13480339	1,382	Aged ≥ 60	1	Rural	"The study area clinic catchment areas with primary health clinics in each area and a government hospital"	NR	• CSID • EURO-D	isiXhosa	Brief 10/66 algorithm

ACE/ACE-R = Addenbrooke's Cognition Examination – Revised, AGECAT = Automated Geriatric Examination for Computer Assisted Taxonomy, B-ADL = Bayer Activities of Daily Living Scale, CAMCOG = Cambridge Cognition Examination, CAMDEX/CAMDEX-R = Cambridge Mental Disorders of the Elderly Examination and revised version, CAS = Caregiver Activity Survey, CSID = Community Screening Instrument for Dementia, CDR = Clinical Dementia Rating , CSDD = Cornell Scale for Depression in Dementia, CERAD = Consortium Establish a Registry for Alzheimer's Disease, CSRI = Client Service Receipt Inventory, DSM-IV = Diagnostic Statistical Manual – version 4, EASI = Everyday Abilities Scale for India, FAB = Frontal Assessment Battery, FAST = Functional Assessment

Staging, FOME = Fuld Object Memory Evaluation, GDS = Geriatric Depression Scale, GHQ-20 = General Health Questionnaire – 20, GMS = Geriatric Mental Status schedule, HMMSE = Hindi Mini-Mental State Examination, HAS-DDS = History and Aetiology Schedule – Dementia Diagnosis and Subtype, IADL-E = Instrumental Activities of Daily Living Scale for the Elderly, IQCODE = Informant Questionnaire on Cognitive Decline in the Elderly, KCSB = Kolkata Cognitive Screening Battery, MDQ = Mood Disorder Questionnaire, MDRS = Mattis Dementia Rating Scale, MINI = Mini International Neuropsychiatric Interview, MMSE = Mini-mental state examination, MoCA = Montreal Cognitive Assessment, NPI-Q = Neuropsychiatric Inventory Questionnaire, NR = Not reported/unclear, PRIME-MD = Primary Care Evaluation of Mental Disorders, QMC = Questionnaire of Cognitive Change, SCAN = Schedule for Clinical Assessment in Neuropsychiatry, SPAS = Survey Psychiatry Assessment Schedule (SPAS), UPDRS = Unified Parkinson's Disease Rating Scale, VSID = Vellore Screening Instrument for Dementia WHODAS-II = World Health Organisation Disability Assessment Scale II, ZBI = Zarit Burden Inventory,

Appendix C

List of excluded studies, alongside rationale.

First author, Year	Record ID	Country	Reason	Evidence
Non-Specific				
Andreasen 2014	13480291	-	Dementia prevalence pooled across countries	-
Prince 2009	8545171	-	Narrative article	-
Rodriguez 2008	13480478	-	Duplicate	Identified as a duplicate upon accessing the full-text (13480477)
Shaji 2010	15752154	-	Review article	-
Brazil				
Barbosa 2009	N002	Brazil	Non-representative sample	"were having been a client of the health care plan for at least 12 months"
Bendetti 2008	N022	Brazil	No formal diagnostic criteria (with face validity) applied.	“To analyze dementia, the classification used was “does not present dementia” (<2 points) and “presents dementia” (≥ 3 points).”
Burla 2013	15752113	Brazil	Review article	-
Burla 2013	15752008	Brazil	Duplicate	Identified as duplicate upon accessing full-text (15752113)
Caixeta 2004	13480313	Brazil	Diagnosis dependent on accessing service	“We evaluated 70 demented patients, consecutively attended in three different care settings: a public psychiatric outpatient clinic, a private memory clinic and the university outpatient dementia ambulatory”

Caldas 2012	15752175	Brazil	No formal diagnostic criteria (with face validity) applied.	"Mean total score on the LCT was 26.3±4.1; this value is above the cut-off proposed for the screening of dementia for this instrument (22 points). Mean total score on the MMSE was 23.4±3.6, oscillating between the case/no case classification proposed by Almeida, in 1998"
Laks 2005	N021	Brazil	No dementia prevalence data reported	Only the MMSE and the Pfeffer Functional Activities Questionnaire scores reported.
Lopes 2007	N004	Brazil	No dementia prevalence data reported	"The instruments for detecting cognitive and functional impairment (CFI)"
Lourenco 2014	15752013	Brazil	Diagnosis dependent on accessing service	"847 elderly individuals derived from a sample stratified by gender and age, who were clients of a Brazilian private health plan"
Meguro 2001	13480428	Brazil	Non-representative sample	"…elderly Japanese immigrants living in Brazil were examined"
Ramos-Cerqueira 2005	N006	Brazil	Non-representative sample	"All individuals aged 65 and older, residents in the urban area of Piraju, a town in Sao Paulo State, Brazil, routinely seen by CHWs [*Community Health Workers*], were included in the present study."
Ribeiro 2011	N007	Brazil	Non-representative sample	"were having been a client of the health care plan for at least 12 months"
Scazufca 2009	15752089	Brazil	No dementia prevalence data reported	No prevalence data reported. Secondary analysis
Suemoto 2017	15752102	Brazil	Non-representative sample	Participants required an autopsy. Participants were excluded if "Subjects with severe chronic

				conditions that might damage cognitive function prior to death by interfering in brain homeostasis. These conditions include severe heart failure, chronic kidney failure and brain metastasis"
Vianna 1991	13480557	Brazil	No formal diagnostic criteria (with face validity) applied.	*"The IMC [Informação, Memória e Concentração] was adapted from Hachinski et al. and tested in previous work (Viana et al.) regarding specificity and sensitivity, with results indicated that this test is an adequate instrument in the detection of dementia in the elderly"* (Translation)
Veras	N020	Brazil	No dementia prevalence reported	The "prevalence of cognitive impairment" is reported only.
Yamada 2002	13480562	Brazil	Non-representative sample	"The epidemiological study was done in 2000 for the Japanese-Brazilian population in Campo Grande in Brazil."
India				
Poddar 2011	13480452	India	No formal diagnostic criteria (with face validity) applied.	"a cut-off score of ≤23 was taken to screen the dementia cases"
Raina 2008	13480468	India	No formal diagnostic criteria (with face validity) applied.	"The clinical evaluation was carried out by a neurologist with the help of two public health specialists. An individual was confirmed as a case of dementia only after the clinical evaluation which also included a revisit to cognitive screen scores (BMSE)."

Riana 2008	13480467	India	Non-representative sample. No formal diagnostic criteria (with face validity) applied.	"The prevalence cohort consisted of 200 individuals aged 60 years and above residing in the Mishriwala migrant community cluster of Jammu city". "An MMSE score below 24 (out of a possible score of 30) was evaluated for clinical diagnosis. This scoring was performed to establish the presence or absence of a dementia syndrome, stage of severity and the likely cause."
Riana 2010	13480465	India	No formal diagnostic criteria (with face validity) applied.	"The clinical evaluation established the presence or absense of a dementia syndrome, its stage of severity, likely cause and estimated date of onset….using a standardized diagnostic protocol"
Riana 2013	13480464	India	No formal diagnostic criteria (with face validity) applied.	"The clinical assessment of dementia involved a careful detailed clinical history to determine the precise features of intellectual loss if any. The subjects were examined for three categories of symptoms: (1) cognitive or intellectual, (2) functional and (3) psychiatric or behavioral. An individual was confirmed as a case of dementia only after clinical evaluation. The clinical evaluation also included the use of cognitive screen scores (BMSE)."
Riana 2014	13480463	India	No formal diagnostic criteria (with face validity) applied.	“The clinical assessment of dementia involved a careful detailed clinical history to determine the precise features of intellectual loss

				if any. The subjects were examined for three categories of symptoms: 1. Cognitive or intellectual, 2. Functional, and, 3. Psychiatric or behavioural"
Saldanha 2010	13480487	India	Out of date sample pool	"…based on 2001 census data" "total study period of study extended from July 2005-September 2007."
Shaji 2005	13480507	India	Duplicate	Identified as a duplicate upon accessing the full-text (*13480510*)
Singh 2008	13480516	India	No formal diagnostic criteria (with face validity) applied.	"Cognitive deficits were assessed by a separate questionnaire prepared by a psychologist, based on existing questionnaires used in developed countries. The questionnaire examined memory function, intelligence, cognition, and behaviors of daily life common among this population"
Indonesia				
Hogervorst 2011	13480375	Indonesia	Out of date sample pool	"All were over 56 years of age and were covered by the local health districts around Borobudur. Some were survivors of our earlier study (Hogervorst, 2008) conducted in 2006. Of these, an estimated 80% could still be contacted for follow-up from Borobudur and Salam districts after the 3 year follow-up in 2009. Follow-up data are discussed in another paper, as this paper concerns the rolling cohort data collected in 2009, which also

				included novel participants who were over 56 years of age in 2009."
Suriastini 2017	N013	Indonesia	No formal diagnostic criteria (with face validity) applied.	"Subjects were diagnosed with dementia when 1. MMSE score was below the normative value after being adjusted for age and education level (see Supplementary 1); 2. Unable to perform one activity in IADL; and 3. AD8 score equal to or higher than 2."
Yefusa 2009	N009	Indonesia	Non-representative sample	"A convenience sample of 298 elderly was included after giving informed consent These participants were attending the local community health centers, or were visited at the institute in which they lived (n=49) or at home (n=1)"
Jamaica				
Waldron 2015	N018	Jamaica	Dementia prevalence not reported	"More than one fifth (21.2%, n = 591) of older adults had mild cognitive impairment and more than one tenth (11.0%, n = 307) had severe impairment. The majority (67.7%, n = 1884) of older adults had no cognitive impairment."
Eldemire 1996	N017	Jamaica	Dementia prevalence not reported	"A community based study using the Folstein minimental screening tool identified 2.3% of the over-60 population as severely impaired and 11.8% as questionable."
Kenya				
Mutiso 2016	N014	Kenya	Age of participants	It is unclear the age of the sample. No ages were reported. It is unclear the diagnostic criteria used to

			No formal diagnostic criteria (with face validity) applied. Non-representative sample.	diagnose dementia. It is unclear whether participants were a representative sample.
Ndetei 2013	N005	Kenya	No formal diagnostic criteria applied	No clear evidence of diagnostic criteria applied. However, The Community Screening Interview for Dementia was used.
Mexico				
Acosta-Castillo 2017	13480273	Mexico	No formal diagnostic criteria (with face validity) applied.	"We developed a dementia algorithm based on: 1) cognitive performance evaluated with the MiniCog, and semantic verbal fluency, and 2) information about the basic and instrumental activities of daily life." Note: Unclear validity of algorithm.
Alanís-Niño 2008	N019	Mexico	No formal diagnostic criteria (with face validity) applied.	*"[The MMSE] is the most used scale in studies epidemiological studies to assess deterioration cognitive and dementia in the Hispanic population. Several studies show that it has a good sensitivity and specificity to identify cognitive impairment It has been used to diagnose dementia, although it's important to consider the patient's education"* (Translation)
Cruz-Alcala 2002	N011	Mexico	No formal diagnostic criteria (with face validity) applied	"*Once identified people suspected of Epilepsy, Vascular Disease Cerebral, Dementia or Parkinson's was validated or discarded the*

				diagnosis by reviewing clinical files or with a new interview at home." (Translation)
Meji-Arango 2011	13480430	Mexico	No formal diagnostic criteria (with face validity) applied.	"Based on cut-points for the two instruments all individuals assessed with the CCCE and the IQCODE were combined in two global groups: cognitive normal and cognitive impaired. Groups were further classified based on functional performance. Those who received help with one or more basic activities of daily living (BADLs) and/or two or more instrumental activities of daily living (IADLs) were considered functionally impaired and those who didn't need help in any activity or needed help only in one IADL were considered functionally normal. Four groups were identified: 1) Subjects without cognitive impairment and functionally normal were the normal group 2) Subjects functionally impaired and with normal cognition were named the FINCI group (for the first letters of functional impairment not cognitively impaired). 3) Subjects with cognitive impairment and no functional impairment were the CIND (for the first letters of cognitive impaired no dementia). 4) Subjects with both cognitive and functional impairment were the Dementia group."

Sanchez-Arenas 2014	15752178	Mexico	Diagnosis dependent on accessing service	Sample only included those "registered with Mexican Institute of Social Security"
South Africa				
Ben-Arie 1983	N012	South Africa	No formal diagnostic criteria applied. Non-representative sample	Diagnosis based on “cognitive impairment” and “social impairment”. The sample was composed of “150 randomly selected Coloured persons aged 65 years or more”

Country	Study		External Validity				Internal Validity						Summary
	Author	ID	1. Close Representation	2. True or Close Representation	3. Random Selection	4. Non-response bias minimal	5. Directly from the subjects	6. Acceptable case definition	7. Reliability and validity	8. Same mode of data collection	9. Length of the shortest prevalence period	10. numerator and denominator	11. Summary
Brazil	Bottino	13480301	H	L	L	H	L	L	L	L	L	L	M
Brazil	Caramelli	15752121	H	H	H	H	L	L	L	L	L	L	H (!)
Brazil	Cesar	13480321	H	L	L	H	L	L	L	L	L	L	H (!)
Brazil	Herrera	15752058	H	L	L	L	L	L	L	L	L	L	L
Brazil	Lopes	13480416	H	L	H	H	L	L	L	L	L	L	H
Brazil	Magalhaes	15752146	H	L	L	L	L	H	L	L	L	L	H (!)
Brazil	Scazufca	13480493	H	L	L	L	L	L	L	L	L	L	L
India	Banerjee	8545180	H	H	L	H	L	L	L	L	L	L	H
India	Banerjee	13480294	H	L	L	H	L	L	L	L	L	L	M
India	Chandra	13480326	H	L	L	L	L	L	L	L	L	L	L

India	Das	15752010	H	L	L	L	L	L	L	L	L	H	L
India	Gurukartick	13480366	H	L	L	H	L	L	L	L	L	L	M
India	Jacob	13480387*	H	H	L	L	L	L	L	L	L	L	M
India	Mathuranath	13480423	H	L	L	L	L	L	L	L	L	L	M
India	Rajkumar	13480469	H	L	L	L	L	L	L	L	L	L	L
India	Rodriguez	13480477*	H	H	L	H	L	L	L	L	L	L	H
India	Seby	N010	H	H	L	L	L	L	L	L	L	L	M
India	Shaji	13480510	H	H	L	L	L	L	L	L	L	L	M
India	Shaji	13480511	H	H	L	L	L	L	L	L	L	L	M
India	Singh	13480516	H	L	H	H	L	L	L	L	L	H	H
India	Tiwari	15752131	H	H	L	L	L	L	L	L	L	L	M
India	Vas	13480548	H	H	L	L	L	L	L	L	L	H	M
Jamaica	Eldemire-Shearer	157520466	L	L	H	H	L	L	L	L	L	L	M
Jamaica	Neita	13480438	H	H	L	H	L	L	L	L	L	L	H
Mexico	Rodriguez	13480477*	H	H	L	L	L	L	L	L	L	H	M

Mexico	Cruz Alcala	N016	H	L	L	L	L	L	H	L	L	H	L
Mexico	Velázquez-Brizuela	13480552	H	L	L	H	L	L	L	L	L	L	M
South Africa	Van der Poel	113480542*	H	H	H	L	H	L	H	L	L	H	H
South Africa	De Jaegar	13480339	H	H	H	H	L	L	L	L	L	L	H
* The study is part of the 10/66 group, (!) = Studies with a very high dementia prevalence rate >15%.													